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## WARTIME SWINE FEEDING

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The increases in numbers of hogs raised by farmers in this country during the past two years, paralleled by increases in poultry and, to a less extent, in numbers of milk cows, necessitate some radical changes in feeding practices. All of these classes of animals are heavy users of concentrate feeds. The tonnage increase in feed requirements is far greater for hogs than for any other class of livestock.

In 1940 the hog crop was in the neighborhood of 80 million head; in 1942 the estimates show that it exceeded 100 million; and in 1943 the crop is expected to reach 120 million. This represents an increase of 50 percent over the pre-war level. Thus far the supply of feed grains has appeared to be adequate. Supplies of mill feeds also appear to be ample. The experiences of farmers since the summer of 1942 have shown that supplies of protein concentrates are not so adequate. Actually, production of these concentrates has increased, on the whole, at a rate about equal to the increase in numbers of animal units. Hog and poultry raisers in recent months, however, have experienced more difficulty than other producers because poultry and hogs are heavy users of protein concentrates in relation to cattle, sheep, and other classes of livestock.

So far as protein feeds for hogs are concerned, the crux of the situation relates to the supply of animal proteins such as tankage, meat meal, fish meal, and milk byproducts versus that of vegetable proteins, particularly soybean meal. With fish meal production greatly reduced and that available reserved mainly for poultry, together with a lack of sufficient increase in supplies of tankage and meat scrap, the net result is a decrease in animal protein concentrates available for hogs, amounting to perhaps 30 percent. On the other hand, the supply of vegetable proteins actually or expected to be available and which must be used for feeding hogs, has at least trebled. Supplies of skim milk fed on the farm to hogs have not changed appreciably.

The change in type of protein concentrates which must be fed under such conditions can be summed up by comparison of ratios. In 1940 there was close to one ton of tankage or other animal protein feed for each ton of vegetable protein feed such as soybean, peanut, cottonseed, linseed, and other comparable oil meals. This year there promises to be only 1 ton of the animal protein concentrate to 5 or 6 tons of the vegetable proteins. Expressed in another way, the trinity mixture for hogs, of former years, in which 50 parts was tankage or fish meal with the other 50 parts divided between vegetable protein feeds such as linseed meal and ground legume meal, no longer expresses the average available supplies. Instead, the animal protein needs to be reduced to perhaps 12 parts and the vegetable protein increased to 65 or 70 parts. To complete the picture on a country-wide basis, the use of approximately 10 parts each of millfeed and alfalfa or other legume meal, as required to give 100 parts in the protein mixture, about represents the supplies which are expected to be available for feeding hogs.

The liberal use of barley, oats, rye and wheat to replace a part of the corn is recommended because of the increase in protein provided by these grains. Furthermore, increased emphasis must be placed on the value and need for using all the skim milk, buttermilk and whey available either on the farm or at the creamery or cheese factory which can be allowed to the pigs and to older breeding stock. Pastures are another means of reducing the needs for purchased protein feeds and for tiding the herd through periods of shortages.

In using purchased protein feeds, it will be highly advisable to mix the animal and vegetable protein concentrates in order that the animal protein supplies can be stretched as far as possible and do the maximum good. These animal proteins are needed mostly by weanling pigs, followed in order by pregnant and nursing sows, other breeding stock, and finally by fattening shoats. Accordingly, mixtures need to be adjusted to allow somewhat higher proportions of animal protein for weanling pigs and sows and lower proportions for fattening hogs. It is not necessary or economical to use tankage, meat scrap, or fish meal as the exclusive protein supplement even to weanling pigs. Commercial feed mixers have adopted a self-rationing program to conserve the animal protein supply as it applies to such feeds. It is recommended that farmers who wish to buy their protein concentrates in straight form, adopt practices whereby they do not use unduly large proportions of tankage or other commercial animal proteins to the detriment of their neighbors. In order to indicate some of the ways by which this can be done, tables of suggested diets and formulas for concentrate mixtures are presented on the following pages.

#### Feeds Suitable for Swine

Carbohydrate-rich feeds: This group consists first of the cereal grains, mainly corn. As already indicated, the use of barley, oats, wheat, and rye which contain about 30 percent more protein than corn, will help to reduce the quantity of protein concentrates needed in the ration. Other cereal and grain products which can be used as a part of the diet include emmer, spelt, rough rice, brewers' rice, rice polish, rice bran, oat millfeed, hominy feed, millet seed, buckwheat, and molasses. As a group, all of these feeds are low in carotene, except yellow corn, and in calcium. The phosphorus content ranks fair in the whole grains and moderately high in some of the mill products such as rice polish and rice bran.

Protein supplements: The animal and marine products which need to be used on a reduced basis include tankages, meat scrap, meat meals, fish meals of various types, blood meal, and liver meal. Besides the liquid skim milk, buttermilk, and whey available to the hog feeder, the semi-solid or dried milk products may also be used. The four plant-source protein meals which have received most attention in recent months are soybean, linseed, peanut and cottonseed. Wheat middlings, wheat shorts, and wheat red dog flour, although only a few percent higher in protein than whole wheat, have long been used by hog feeders. These feeds help to reduce the amount of high-protein concentrates needed in the ration for best results and besides have other properties to commend their use. Other products which should be mentioned are corn-germ meal, corn-oil meal, and distillers' dried grains with solubles. The last-named feed and variations of it which are high in solubles promise to become available in increasing quantities through the reclaiming of the distillery slop from the manufacture of alcohol for war purposes. Still other feeds which may be available in some areas and are useful



in varying degrees as protein savers are rye middlings, rye feed, barley feed, buckwheat middlings, field peas, pea feed, cowpeas, cull beans (cooked), coconut-oil meal, sesame-oil meal, sunflower-seed-oil meal, dried yeast, bakery waste, palmo middlings, and garbage.

Forage crops: The list of forage crops useful for pasture or grazing by hogs includes alfalfa, clover, rape, field peas, soybeans, cowpeas, velvet beans, oats, rye, wheat, bluegrass, sudan grass, and the sorghums. To this list may be added the root crops such as potatoes, sweetpotatoes, mangels, beets, and peanuts. If soft or oily pork is to be avoided or kept from being too objectionable the peanuts should be grazed by breeding stock and feeder pigs but not by fattening shoats.

Where dried forages must be used either in winter or in dry-lot feeding, a variety of legumes can be utilized by hogs as hay. When ground, these hay meals may be used in the mixed diet or in the protein supplement. Alfalfa, clover, soybean, lespedeza, field peas, and kudzu are all satisfactory.

### Methods of Feeding

The urgent need for pork requires intelligent utilization of present supplies of feed to protect the hogs' health and to promote growth. The primary object in pork production is to keep animals gaining at their maximum rate from birth to a finished market weight.

A careful survey of facilities for hog raising should be made and plans adopted to stagger the farrowing so as to utilize the hog-lot equipment to its capacity without overcrowding. Feed supplies should be planned accordingly. Good management practices and an effective sanitation program should be followed; otherwise good feed may be wasted in pigs that drop out along the way.

The self-feeder is a common method employed to produce pork quickly and with a minimum of labor. The best way to regulate the proportions of constituents of the diet is to mix the grain, protein, and mineral constituents and self-feed this mixture. There are times, however, when the three materials may be placed in separate compartments of the self-feeder and the hog allowed to choose the proportion of each feed according to its appetite. This does not mean, however, that daily attention is not required on the part of the farmer. The self-feeder should be checked at least twice daily to see that it is working properly and that feed is available. It is especially important when the self-feeder is used that a good supply of clean fresh drinking water be available at all times. Hogs require plenty of water to utilize their feed efficiently.

Where hand feeding is practiced the plan of increasing the number of feedings daily usually produces faster gains. The time of feeding, intervals between feedings, and regularity from day to day are important. A hog with a comfortably full stomach is more content than one that is uncomfortably full at one time and hungry at another time.

Table 1.— Protein mixtures combined with minerals for swine  
fed in dry lot without any pasture

SERIES A—SUPPLEMENTS WITH MODERATELY LIBERAL AMOUNTS OF ANIMAL PROTEIN FOR PREGNANT AND LACTATING SOWS AND FOR YOUNG PIGS. (THE TOTAL PROTEIN CONTENT WILL APPROXIMATE 35, THE CALCIUM 3.1, AND THE PHOSPHORUS 1.2 PERCENT)

Feedstuff	Mixture designation							
	A1	A2	A3	A4	A5	A6	A7	A8
	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent
Tankage or meat scrap	20	20	20	20	20	20	20	20
Linseed meal	20	—	25	15	—	20	—	—
Soybean meal	25	25	—	20	45	30.5	—	—
Cottonseed meal	—	15	20	15.5	—	—	20	—
Peanut meal	—	—	—	—	—	—	25	50.5
Middlings	10.5	10.5	10.5	—	10.5	—	10.5	—
Alfalfa meal	20	25	20	25	20	25	20	25
Iodized salt*	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25
Ground limestone	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Special elements*	.25	.25	.25	.25	.25	.25	.25	.25

SERIES B—SUPPLEMENTS WITH AN INTERMEDIATE LEVEL OF ANIMAL PROTEIN FOR PIGS WEIGHING 60-130 POUNDS. (THE TOTAL PROTEIN CONTENT WILL APPROXIMATE 34, THE CALCIUM 2.7, AND THE PHOSPHORUS 1.0 PERCENT)

Feedstuff	Mixture designation							
	B1	B2	B3	B4	B5	B6	B7	B8
	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent
Tankage or meat scrap	10	10	10	10	10	10	10	10
Linseed meal	20	—	20	20	—	21	—	20
Soybean meal	35	35	—	25	50	40	30	—
Cottonseed meal	—	20	15	16	—	—	—	—
Peanut meal	—	—	20	—	—	—	25	40
Middlings	9.50	9.50	9.50	—	15	—	9.50	—
Alfalfa meal	20.00	20.00	20.00	23.50	19.50	23.50	20.00	24.50
Iodized salt*	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50
Ground limestone	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00

SERIES C—SUPPLEMENTS WITH NO ANIMAL PROTEIN FOR PIGS WEIGHING OVER 130 POUNDS. (THE TOTAL PROTEIN CONTENT WILL APPROXIMATE 34, THE CALCIUM 2.8, AND THE PHOSPHORUS .7 PERCENT)

Feedstuff	Mixture designation							
	C1	C2	C3	C4	C5	C6	C7	C8
	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent
Linseed meal	23	—	25	23	—	—	—	20
Soybean meal	50	50	—	30	50	73	—	20
Cottonseed meal	—	23	25	20	—	—	—	15
Peanut meal	—	—	25	—	23	—	73	18
Alfalfa meal	20	20	18	20	20	20	20	20
Iodized salt*	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50
Ground limestone	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50

\*The special elements consist of a mixture of iron oxide or sulfate, 80 parts; copper sulfate, 5 parts; manganese sulfate, 14 parts; and potassium iodide, 1 part. Where iodized salt is obtainable, omit the potassium iodide in the special element mixture.



For best results it is important to have the pigs sorted into lots of approximately the same age and weight basis. The handling of pigs of different size in the same lot is poor management, as the larger pigs may crowd the smaller ones away from the feed and retard their growth and development.

There may be times during the production cycle when it becomes necessary to limit the amount of daily feed until a new crop becomes available. When necessary to reduce the total quantity of feed given daily it is very important that the quality of the ration be maintained, or even improved, so that the hog can be kept in a good state of health and ready to make a rapid finish later when ample feed is again available, or when crops may be hogged down in the field.

No one of the above methods can be recommended to suit all conditions. It is the duty of the individual feeder to determine which method or combination of methods will give him most efficient production in the least time under his particular farm program.

#### Protein and Mineral Supplement Mixtures

A number of combination protein and mineral supplements are presented in tables 1 and 2, which show some of the ways in which animal and vegetable proteins can be combined effectively. Each table consists of three series varying in tankage or meat scrap (source of animal protein) content. The first series shows combinations containing 20 percent of animal protein concentrates which are suitable for pregnant and lactating sows and for young pigs; the second series shows how to provide 10 percent animal protein mixtures and these are recommended especially for pigs of intermediate weights; and the third series lists no tankage or meat scrap for fattening shoats and maintenance of the breeding herd. These formulas provide the animal protein where it is most essential. Furthermore, adherence to the general program of use on a year-round basis will use the supplies approximately in the proportions they are available in the country. Where animal proteins, other than the tankage or meat scrap, are preferred or are available they can be substituted on an equal protein basis.

Table 1 is designed for use in dry-lot feeding and includes alfalfa meal. Other ground legume hays such as soybean, lespedeza, or clover can, of course, be substituted for the alfalfa meal. It will be noted that the mineral additions include iodized salt and ground limestone in all three series. In those areas where iodine deficiency is not a serious problem, plain salt is satisfactory. The first series (A) provides for the addition of a small amount of a mixture of salts to provide iron and copper for protection against anemia, manganese for protection against a deficiency of this element, and iodine where the user prefers this mode of incorporation to the use of iodized salt. It is not considered essential to add the special elements in the diets of pigs above 60 pounds in weight.

Table 2 gives various protein and mineral supplement combinations suitable for the feeding of pigs on pasture. The mixtures are comparable to those in table 1 except for the omission of the ground legume hay.

**Table 2.—Protein mixtures combined with minerals for swine  
fed on pasture**

**SERIES D—SUPPLEMENTS WITH MODERATELY LIBERAL AMOUNTS OF ANIMAL PROTEIN FOR PREGNANT  
AND LACTATING SOWS AND FOR YOUNG PIGS. (THE TOTAL PROTEIN  
CONTENT WILL RANGE FROM 37 TO 40 PERCENT, THE CALCIUM  
WILL APPROXIMATE 3.1, AND THE PHOSPHORUS 1.3 PERCENT )**

Feedstuff	Mixture designation							
	D1	D2	D3	D4	D5	D6	D7	D8
	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent
Tankage or meat scrap	20	20	20	20	20	20	20	20
Linseed meal	20	--	--	25	--	--	25	25
Soybean meal	35	35	--	50	--	55	30	--
Cottonseed meal	--	15	20	--	20	20	--	15
Peanut meal	--	--	35	--	55	--	--	20
Middlings	20	25	20	--	--	--	20	15
Iodized salt*	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25
Ground limestone	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75

**SERIES E—SUPPLEMENTS WITH AN INTERMEDIATE LEVEL OF ANIMAL PROTEIN FOR PIGS WEIGHING  
60 TO 130 POUNDS. (THE TOTAL PROTEIN CONTENT WILL APPROXIMATE 36,  
THE CALCIUM 2.7, AND THE PHOSPHORUS 1.0 PERCENT)**

Feedstuff	Mixture designation							
	E1	E2	E3	E4	E5	E6	E7	E8
	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent
Tankage or meat scrap	10	10	10	10	10	10	10	10
Linseed meal	25	--	25	20	--	--	20	15
Soybean meal	40	45	--	25	60	--	--	25
Cottonseed meal	--	20	15	20	--	--	--	15
Peanut meal	--	--	25	--	--	60	40	15
Middlings	19	19	19	19	24	24	24	14
Iodized salt*	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50
Ground limestone	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50

**SERIES F—SUPPLEMENTS WITH NO ANIMAL PROTEIN, PRIMARILY FOR PIGS WEIGHING OVER 130  
POUNDS. (THE TOTAL PROTEIN CONTENT WILL APPROXIMATE 33, THE  
CALCIUM 2.5, AND THE PHOSPHORUS .8 PERCENT)**

Feedstuff	Mixture designation							
	F1	F2	F3	F4	F5	F6	F7	F8
	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent
Linseed meal	23	--	--	20	20	--	--	25
Soybean meal	50	50	50	20	--	75	--	50
Cottonseed meal	--	23	--	15	15	--	--	18
Peanut meal	--	--	23	20	40	--	75	--
Middlings	20	20	20	18	18	18	18	--
Iodized salt*	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50
Ground limestone	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50

\*The use of iodized salt is particularly recommended in the goiterous areas. Plain salt is satisfactory in areas where livestock do not suffer from iodine deficiency.



The mixtures listed in tables 1 and 2 by no means exhaust the possible combinations or the number and variety of supplements. A number of relatively uncommon protein meals such as sesame, babassu, and others are or may become available in some parts of the country and can be substituted for a part or all of that of a listed protein component. Dried distillers' byproducts, especially grains with solubles, are another possibility as a replacement for middlings. Besides this latter feedstuff, wheat red dog flour or shorts can be used interchangeably with it.

For those farmers who are able to prepare or prefer to use complete feed mixtures, information is given in table 3 on the recommended percentages of protein in the diets for different classes of swine--both for dry-lot and for pasture feeding. These percentages will serve as a guide also in checking how well the pigs balance their feed intake on the free-choice consumption basis. Using the figures in table 3 as a guide, grain and protein-mineral concentrate mixtures can be calculated which will supply the recommended levels of protein.

Table 3.—Recommended protein content of diet for different classes of swine

<u>Class of swine</u>	<u>Dry-lot</u> Percent	<u>Pasture</u> Percent
Pregnant gilts.....	15	13
Pregnant sows .....	13	11
Lactating sows .....	15	13
Weanling pigs .....	19	18
Growing pigs, up to 125 pounds...	16	14
Fattening pigs, 125 to 250 pounds.	14	12

Table 4 gives the proportions of corn and protein-mineral mixtures for different classes of stock in dry-lot and on pasture. For example, in preparing a diet containing 15 percent of protein for pregnant gilts confined in dry-lot, 80 parts of cracked or ground corn can be mixed with 20 parts of any one of the 8 mixtures designated as A1 to A8 in series A of table 1. Young weanling pigs can be started on a feed mixture containing the series A or series D supplement mixtures. At weights of approximately 60 pounds, change can be made to the B or E series depending on whether fed in dry-lot or on pasture.

Table 4.—Corn and protein-mineral mixture combinations for pasture and dry-lot use, which give the needed protein content

Class of pig	Dry-lot				Pasture		
	Corn	Protein-mineral			Corn	Protein-mineral	
	Percent	Series	Percent		Percent	Series	Percent
Pregnant gilts .....	80	A	20	:	83	D	17
Pregnant sows .....	88	A	12	:	90	D	10
Lactating sows .....	80	A	20	:	83	D	17
Weanling pigs to 60 pounds .....	67	A	33	:	70	D	30
Growing pigs, 60 to 130 pounds..	73	B	27	:	82	E	18
Fattening pigs, over 130 pounds.	81	C	19	:	89	F	11

Table 5 is included to show how small grains such as wheat, rye, barley, and oats can replace part of the corn and also save some protein. For example, fattening pigs on pasture need only 5 percent of the protein-mineral mixture of series F when half of the concentrate diet is small grain as compared to 11 percent when corn is the exclusive feed.

Table 5.—Small grain\*, corn, and protein-mineral mixture combinations for dry-lot and pasture use, which give the needed protein content

Class of pig	Dry-lot					Pasture			
	Small grain	Corn	Protein-mineral			Small grain	Corn	Protein-mineral	
	Percent	Percent	Series	Percent		Percent	Percent	Series	Percent
Pregnant gilts.....	50	33	A	17	:	50	35	D	15
Pregnant sows.....	50	45	A	5	:	50	45	D	5
Lactating sows.....	50	34	A	18	:	50	35	D	15
Weanling pigs, up					:				
to 60 pounds.....	40	30	A	30	:	40	35	D	25
Growing pigs, 60 to					:				
130 pounds.....	50	30	B	20	:	50	38	E	12
Fattening pigs,					:				
over 130 pounds..	50	38	C	12	:	50	45	F	5

\*The small grain may be ground wheat, ground or rolled barley, a mixture of equal parts ground rye and ground oats, or other equivalent combinations.

Dairy byproducts as supplements: Farmers who have skim milk available on the farm or who can obtain buttermilk or whey are especially fortunate since these byproducts can greatly reduce or even eliminate the need for purchased protein, mineral and vitamin-rich feeds. The high quality of the proteins in skim milk and buttermilk, especially as supplements to the grains, make it possible actually to use less total protein in the milk-grain ration than in the combination rations

of vegetable meals, tankage, and grains described above. With skim milk or buttermilk available, there is correspondingly less need for the incorporation of tankage, meat scrap or fish meal into the diet. In other words, it is possible, in fact advisable in view of the shortages of meat meal proteins, to dispense with the use of such supplemental mixtures as those described in series A, B, D, and E of tables 1 and 2. If 3 to 4 pounds of skim milk a day are fed to pregnant sows and gilts, and to pigs from the suckling period through the fattening period, and 8 pounds to lactating sows, the percentages of protein-mineral mixtures in table 4 can be cut in half and the corn correspondingly increased. Furthermore, only series C mixtures need to be used in dry-lot and series F in pasture feeding. It follows that doubling the allowance of skim milk to 6 to 8 pounds and to 16 pounds (1 and 2 gallons) will permit the entire elimination of other protein supplements and of calcium and phosphorus supplements as well. Undoubtedly the partial substitution of skim milk for other protein supplements is to be preferred because it permits the combining of animal and vegetable proteins in highly efficient mixtures.

Whey is generally considered worth about one-half as much as skim milk for growing pigs. The protein content is less than one-third that of skim milk but is of excellent quality. In general, it is not advisable to depend on whey as the sole supplement to corn although this feed can serve satisfactorily with barley, oats and wheat.

#### Other Sources of Information

A discussion of "The Nutrition of Swine During the War Emergency" was published in December 1942 by the National Research Council, as Report No. 6. Copies may be obtained at a price of 10 cents by addressing inquiries to 2101 Constitution Avenue, Washington, D. C. Many of the State colleges of agriculture and extension services have also published emergency recommendations applicable to local conditions in their sections of the country. It is suggested therefore that you consult your State agricultural services for additional or alternative suggestions on feeding recommendations.

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